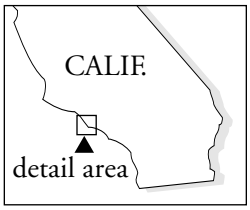
✲ Versión disponible en español

MONTROSE AND DEL AMO SUPERFUND SITES



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 9 • SAN FRANCISCO, CA • JUNE 1998

EPA Proposes Groundwater Cleanup Plan

(General Fact Sheet Version)

A technical and expanded version of this proposed plan is also available upon request.

Los Angeles Co., California

This Proposed Plan* presents the U.S. Environmental Protection Agency's (EPA) preferred cleanup alternative for the groundwater at the Montrose and Del Amo Superfund sites. As discussed below, EPA is requesting written and oral comments on this plan. The information EPA considered in this process is available to the public at the Torrance and Carson Public Libraries (the addresses of the libraries can be found at the end of the fact sheet).

The purpose of this fact sheet is to provide specific information about the groundwater contamination and the cleanup alternatives EPA is considering, to assist the public in providing its comments. This fact sheet serves as a companion to the remedial investigation (RI) reports, the Joint Groundwater Feasibility Study (JGWFS) report, and the administrative record file upon which this proposed remedy is based. *EPA's proposed remedy is preliminary and a final decision will not be made until all comments are considered.* The remedy selected in the final ROD could differ from the preferred alternative based on EPA's response to comments.

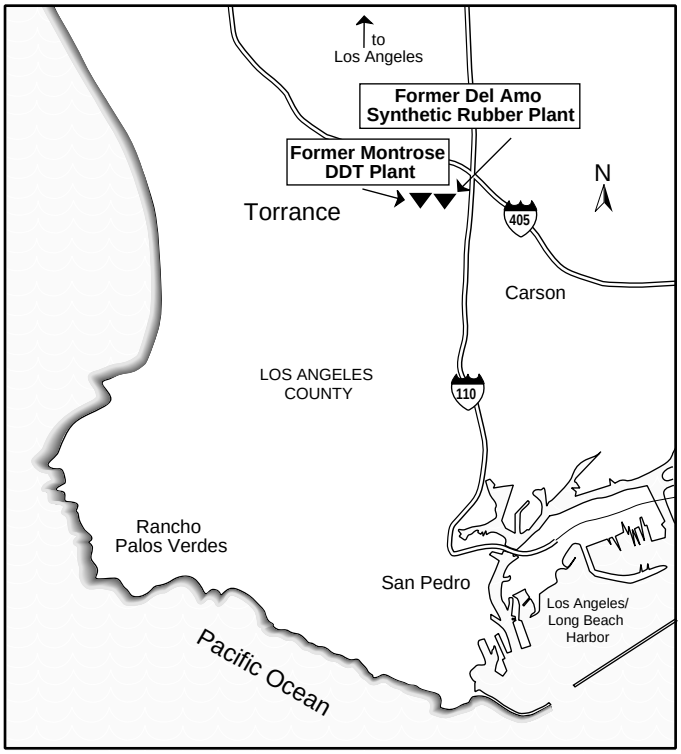


Figure 1: Location of Montrose and Del Amo Superfund sites

**Notice: the publication of this fact sheet fulfills the requirements of Section 117(a)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).*

COMMUNITY MEETING

A 30-day public comment period on this proposed plan and preferred remedy begins **July 2**, **1998**, and closes **July 31**, **1998**. If requested, EPA may extend the comment period by an additional 30 days. Requests for a 30-day extension must be received in writing by EPA no later than **July 16**, **1998**.

A public meeting will be held to solicit comments and answer questions about the site on

Saturday, July 25

at Torrance Holiday Inn

19800 S.Vermont St.

(between 190th St. & Del Amo Blvd.)

1:00-2:30 p.m: **Informational Workshop**

3:00-5:00 p.m: **Comments Received**

Comments may also be made in writing and sent to:

EPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105
attn: Jeff Dhont (SFD-7-1)

EPA will issue a Response Summary to formally address pertinent comments received during the comment period when EPA's decision on the remedy is released.

This general fact sheet version of EPA's proposed plan provides an overview, explains some possibly unfamiliar technical concepts, and uses less technical language. A technical and expanded version of this proposed plan is available upon request. Both versions taken together represent EPA's proposed plan for this cleanup action. Both versions are intended to aid the public in commenting on EPA's proposed remedy, the RI documents and the JGWFS.

In preparing this Proposed Plan, the RI documents and the JGWFS, EPA has consulted with its counterparts at the California Department of Toxic Substances Control, and the California Regional Water Quality Control Board, Los Angeles Region.

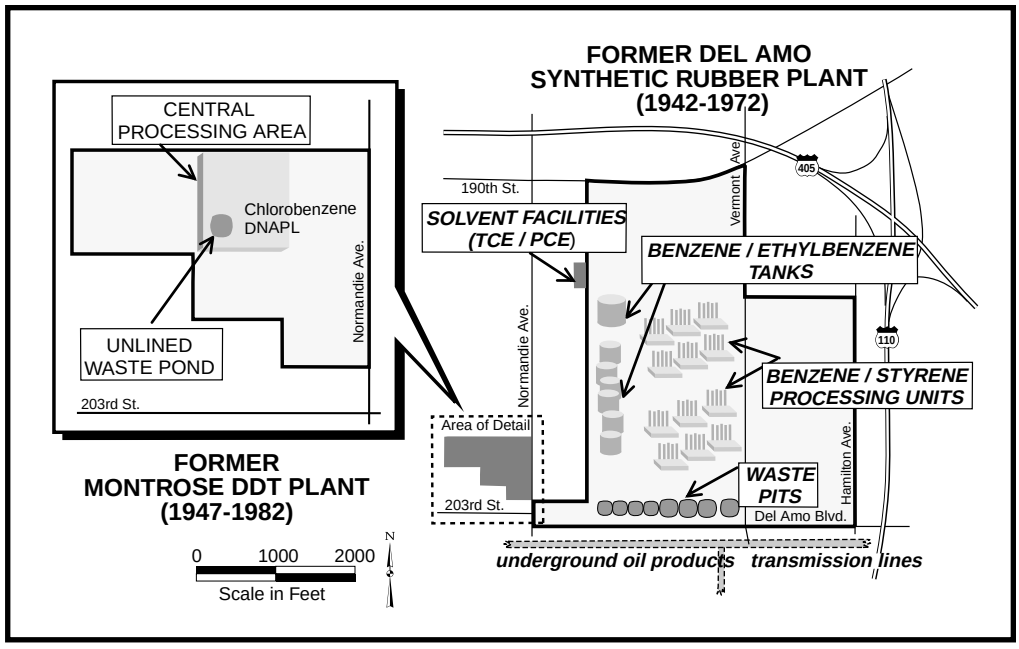


Figure 2: Major Sources of Contamination

This Proposed Plan Applies to Groundwater at Two Sites

EPA is proposing cleanup actions for two adjacent Superfund sites in the Torrance/Carson area (Figure 1). These are called the Montrose Chemical site and the Del Amo site. The groundwater contamination from these sites has to some degree mixed together and it is appropriate to develop and propose cleanup options for the groundwater at both sites together, at the same time. This Proposed Plan contains cleanup actions for only the *groundwater* contamination (see discussion of groundwater, below), and certain types of contamination that affect groundwater. Other types of contamination, such as may be found in surface soils, buildings, stormwater pathways, and sewer lines at the Montrose and/or Del Amo sites, are being addressed separately by EPA.

EPA's Proposed Cleanup Plan

EPA's proposed cleanup for the groundwater contamination[1] at the Montrose and Del Amo Superfund sites includes:

- Extracting and treating groundwater until the water in the ground is cleaned to drinking water standards, except for certain areas where this is not technically feasible;
- Containing the contamination in areas where it cannot be cleaned up to drinking water standards so that it cannot spread further;
- Use of monitored intrinsic biodegradation (microorganisms such as bacteria in the ground) to contain contamination in a certain area of contaminated groundwater;
- Injection back into the aquifer of most of the water treated after extraction;
- Discharge of a small portion of the treated water to the storm drain leading to the Dominguez Channel;
- Monitoring (sampling) of the levels and movement of groundwater contamination;
- Institutional controls (restrictions on groundwater use); and
- A waiver of the requirement to clean the groundwater to drinking water standards for certain highly contaminated areas of groundwater near non-aqueous phase liquids (NAPL); EPA believes it is technically infeasible to clean groundwater in these areas to drinking water standards.

EPA's preferred cleanup alternative is **Alternative 4,** discussed later in this fact sheet.

With this proposed remedy, EPA is proposing to finalize the portion of the Del Amo Waste Pit remedy that EPA had designated as interim when it issued its Record of Decision (ROD) for that remedy in 1997.

This Proposed Cleanup Plan is unusually complex because (1) a form of contamination called Non-Aqueous Phase Liquids (NAPL) is present which cannot be completely removed and currently continues to contaminate the groundwater, (2) EPA has evaluated differing cleanup options for several different but related areas of groundwater, and (3) EPA proposes to rely on more than one cleanup process to accomplish the cleanup goals.

To assist you in understanding the proposal, EPA has included explanations of a number of key concepts, such as *NAPL*, *containment*, *intrinsic biodegradation*, *risk*, the way in which EPA has *divided the groundwater* into various areas,

[1]The groundwater at these sites is contaminated by hazardous substances under the Superfund law.

and what EPA does for *groundwater that can't be cleaned completely*. In general, EPA proposes to clean most of the contaminated groundwater areas to drinking water standards, contain the contamination in the areas which can't be cleaned, and to monitor cleanup actions to ensure that they are effective in protecting human health and the environment.

Site Description and History

To evaluate the groundwater contamination, EPA has given the name "joint site" to the groundwater contamination from the Del Amo and Montrose sites and from a few smaller nearby facilities which will be affected by the cleanup. There are sources of groundwater contamination from other facilities in the area which are far enough away that they are unlikely to be affected by the cleanup actions for the joint site. The sources of contamination discussed below are shown in Figure 2.

Montrose Chemical Corporation operated a DDT-manufacturing plant at the 13-acre property at 20221 Normandie Avenue between 1947 and 1982. DDT was one of the most-widely used pesticides in the world until 1972, when the use of DDT was banned in the United States for most purposes. Montrose manufactured, formulated, packaged, and distributed DDT.

According to analyses conducted by Montrose, EPA, and State and local agencies, contaminants from the former Montrose plant have been released into the environment. DDT has been found in surface soils at and adjacent to the former plant property, in stormwater runoff channels, in sanitary sewer lines, and in various neighborhood soils.

Chlorobenzene, a chemical Montrose used to make DDT, has extensively contaminated the groundwater, along with DDT and other chemicals. Groundwater contamination from the Montrose plant is more than a mile long and is present at depths of more than 300 feet below the ground.

Stauffer Chemical company also operated a small plant on the Montrose property which produced another pesticide called BHC. This plant used benzene to make BHC.

Montrose dismantled the plant in 1983-1985 and the property is now vacant and covered with a temporary asphalt cover. The Montrose Chemical Site was finalized as a Superfund Site on the National Priorities List in 1989. Montrose Chemical Corporation has been issued several orders from EPA since 1983 under the Superfund law.

A 270-acre synthetic rubber facility, which came to be known as the "Del Amo Plant," was operated by several companies, including Shell Chemical Company and the Dow Chemical Company, between 1942 and 1972. The former plant lies to the east of the former Montrose plant, between 190th Street and Del Amo Boulevard. The United States owned the plant until 1955 when it was sold to Shell.

The Southwestern third of the rubber plant contained tanks, pipes, and other facilities which released hazardous substances including benzene, ethylbenzene, and other contaminants into the soils under the plant. Along the southern border of the Del Amo site, a series of open and unlined waste pits were used by the plant for storage and disposal of wastes, including benzene, ethylbenzene, naphthalene, and tarry wastes of widely varying constituency. The residual waste in these pits (except Pit 1A) remain in place and buried under clean fill. In 1997, EPA selected a separate cleanup action for the waste pits that is currently in the design phase. Groundwater under the former Del Amo plant and pits is contaminated with benzene, ethylbenzene, naphthalene, and other contaminants.

In 1972, the plant property was sold to a development company and the plant was dismantled. Most of the property has since been subdivided and developed as an industrial park. The Del Amo Site was finalized on the NPL in late 1997. Shell and Dow Chemical have been responding to an EPA order with respect to the Del Amo site since 1992.

In addition to the former Montrose plant and the former Del Amo plant, there are several other smaller facilities in the immediate area of the Montrose and Del Amo sites which have contributed chlorinated solvents to groundwater,

WHAT IS GROUNDWATER?

Groundwater is water beneath the surface of the ground. At the joint site, a significant amount of groundwater does not occur until about 50-60 feet below land surface. Below this depth, called the water table, the soils become saturated with water and hold it much like a soaked sponge.

This water is a resource which can be used by people for drinking, irrigation, or industrial processes. Groundwater occurs in various soil layers called aquifers. The groundwater moves through these aquifers, like water being pushed through a sponge by a hose, only much more slowly. It may move a few tens of feet or only a few inches in a year, depending on the nature of the layer. Some soil layers are dense like clay, so that water usually moves very slowly in them. Other layers are coarse, like sand or cobbles, and the water can move more quickly.

At the joint site, chemicals from the ground surface have percolated downward through the soil and reached the water table, where they have dissolved, contaminated the groundwater, and then spread out in the moving groundwater.

including trichloroethylene (TCE) and perchloroethylene (PCE). These are located south of the former Montrose plant and on the northwest corner of the former Del Amo plant.

WHAT IS NAPL?

NAPL is a technical word which means "**N**on-**A**queous **P**hase **L**iquid." NAPL is not the name of a chemical, but a *form* of a chemical. Put simply, NAPL is the pure form of a liquid which dissolves only a little in water. Some things dissolve quickly in water, such as sugar. In contrast, oil doesn't mix with water well at all, but a very small amount of the oil will dissolve into the water. Pure oil is a NAPL.

Certain types of liquid chemicals behave this way in the environment. These chemicals are NAPL when they are in their pure, highly-concentrated form. As groundwater moves into and through the NAPL, the NAPL dissolves *very slowly*. Most of the NAPL remains in place, and can be extremely difficult to remove from the ground. A good way to understand NAPL is to imagine running water on a sponge that is filled with oil-based paint. The water coming out of the sponge has paint in it, but the sponge stays filled with paint for a very long time, even if you run the faucet full-force. The ground is millions of times larger than this sponge, and the water in the ground moves much more slowly than the water from a faucet. So, NAPL can remain for hundreds of years in the ground, slowly dissolving in the groundwater (Figure 3).

At the joint site, the chemicals **benzene** and **chlorobenzene** are present in NAPL form as well as in dissolved form in the groundwater.

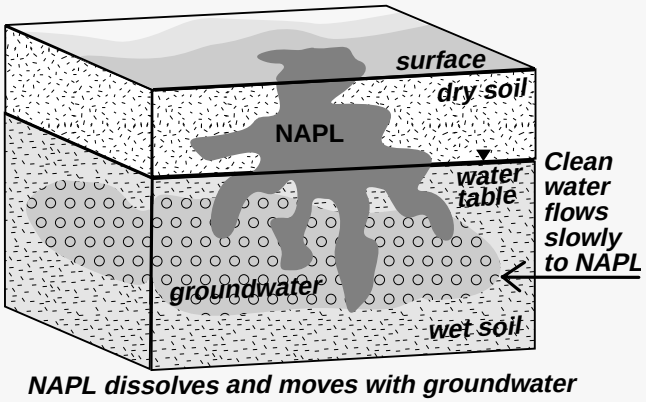


Figure 3: NAPL in Groundwater

Why is EPA Concerned?

At present, no one is drinking or using the contaminated groundwater under the joint site. However, the State of California has classified all water under the joint site as beneficial potable use, meaning it could potentially be used for drinking water. The current wells that are used for drinking water are located outside of the area of groundwater contamination and almost all of them draw water from aquifers (layers) below those currently contaminated. For these reasons, you and your community are not currently exposed to contaminated groundwater.

However, EPA is concerned that the groundwater contamination may continue to move both away from the former plants and downward, and may eventually reach locations where it would be drawn into wells that are used as a source of water for drinking or other potable purposes. If the groundwater at the joint site were actually used by someone, it would pose an extreme health risk (See risk discussion later in this fact sheet). Because the NAPL and dissolved contamination can remain for a very long time (hundreds of years), this contamination can serve as a future threat to the health of groundwater users if it is not appropriately addressed.

It is also possible that if the groundwater at the joint site were restored to drinking water standards, it would be used as a potable resource, and new wells would be installed in the area. As contamination spreads, less of the groundwater resource can be used.

Nature and Extent of Groundwater Contamination at the Montrose and Del Amo Sites

At the joint site, there are several areas where there is NAPL in the soil, both above and below the water table. Below the water table, outside the NAPL areas, there is a larger area where the dissolved contamination has moved with the groundwater. At the former Montrose plant, the chlorobenzene NAPL is heavier than water and tends to sink. This NAPL may have reached depths of 180 feet or more below the surface of the ground. At the Del Amo site, the benzene NAPL is lighter than water, and tends to be found close to the water table, at depths of 60-90 feet below the surface of the ground.

The area of chlorobenzene NAPL contamination at Montrose is under the former Central Processing Area of the Montrose plant. The benzene NAPL and suspected NAPL contamination under the former Del Amo plant is found in many locations: (1) near a former benzene tank and associated piping on the western edge of the former Del Amo plant between Francisco and Knox Streets, (2) near the Del Amo waste pits, (3) in multiple locations where there

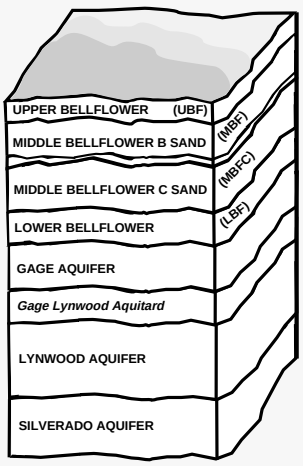


Figure 4: Layers of soil below the ground surface

were chemical units and storage tanks in the former Del Amo plant, (4) an area east of the waste pits where a benzene pipeline had existed, and (5) in an area east and north of the waste pits.

The major chemicals that EPA has used as a focus for evaluating cleanup of groundwater at the joint site are: chlorobenzene (found at levels up to about 400,000 parts per billion (ppb)), benzene (found at levels up to 1,700,000 ppb), and trichloroethylene, or TCE (found at levels up to about 10,000 ppb). These are found in the widest distribution and in the highest concentrations. They also have the greatest potential toxicity. There are many other chemicals in the groundwater (see the Remedial Investigation Reports and the Feasibility Study Report). These include but are not limited to ethylbenzene, naphthalene, perchloroethylene, chloroform, dichlorobenzene and DDT. However, all of these can be addressed by the same cleanup actions that address chlorobenzene, benzene, and TCE. The chemical p-CBSA is also present (see page 13).

The layers of soil below the water table (see the box What is Groundwater?) under the Montrose and Del Amo sites are shown in Figure 4. Water moves more slowly in the two shallowest (upper) layers, the UBF and MBFB Sand, because the soils in these layers are more fine-grained, like silts. Water moves more quickly in the deeper MBFC Sand, Gage Aquifer, and Lynwood Aquifer, because the soils in these layers are more coarse-grained, like sands. Water moves very slowly in the layer called the LBF on Figure 4. Groundwater generally moves toward the southeast in most of these layers.

To measure groundwater contamination, more than one hundred monitoring wells were installed in the ground under the oversight of EPA. Water from these wells has been sampled and analyzed over several years. This sampling allows scientists to draw maps of the groundwater contamination. Figure 5 shows the approximate areas of contaminated groundwater under the joint site. This figure shows all the layers combined together, even though contamination in each layer varies.

Southeast of the Montrose site, dissolved chlorobenzene has traveled more than 1.3 miles from the former Montrose plant (Figure 5). Figure 5 shows two areas where there is benzene: one area where the dissolved benzene in the groundwater is not mixed with the chlorobenzene, and another area where benzene has mixed with the chlorobenzene. The benzene that is mixed with the chlorobenzene has traveled a significant distance in the moving groundwater (the better part of a mile). In contrast, the benzene that is not mixed has traveled a very short distance from the benzene in NAPL form.

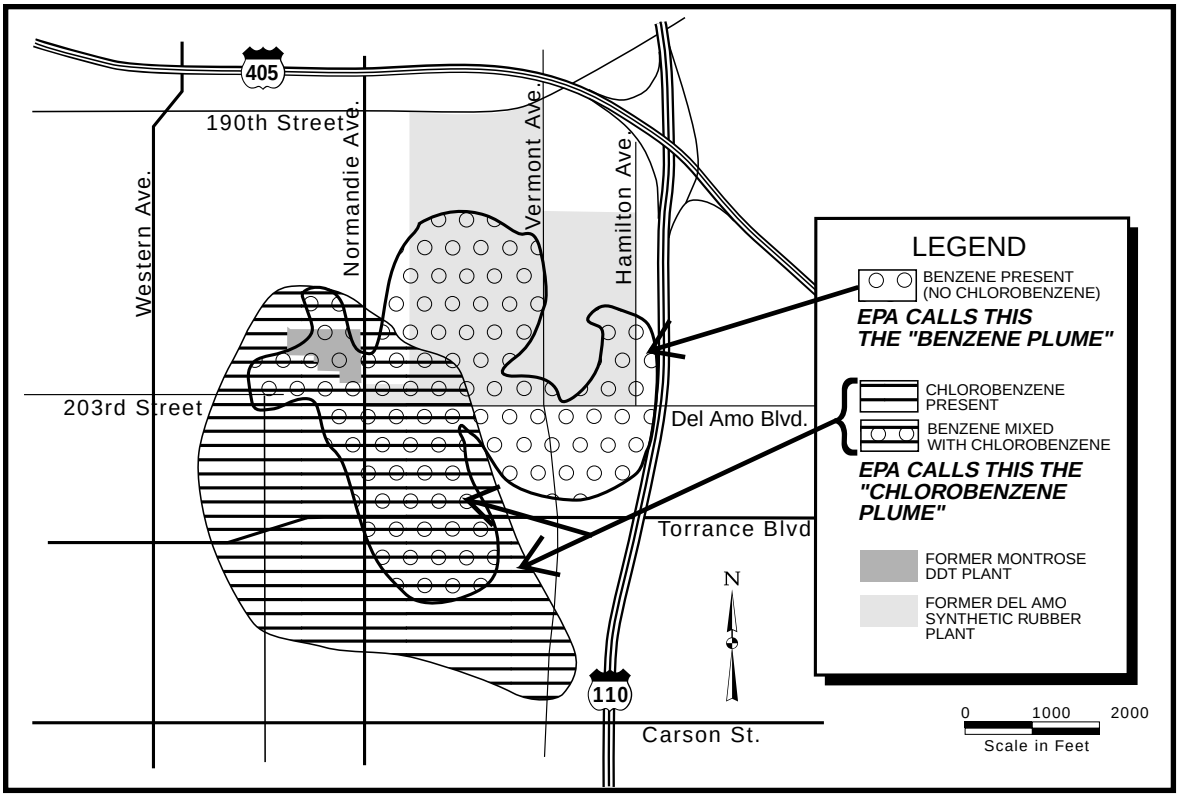


Figure 5: Benzene and Chlorobenzene Plumes

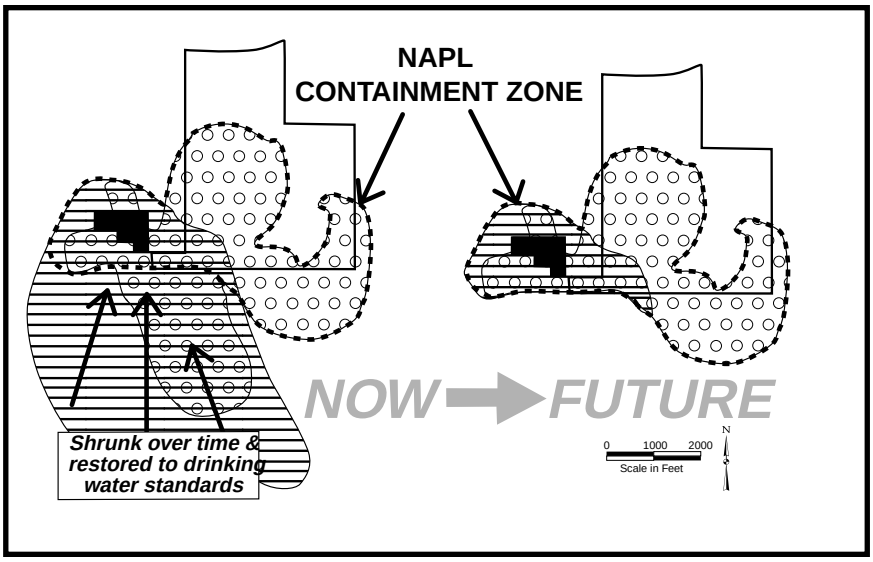


Figure 6: EPA's approach to groundwater cleanup

How EPA Divided the Contamination to Evaluate Cleanup Options

The contaminants in groundwater at the joint site behave differently depending on where they are and whether they are mixed with chlorobenzene. Because of this, EPA has considered different cleanup actions for various areas of groundwater. EPA has defined three areas of contamination and given them names (Figure 5). The first area is called the chlorobenzene plume. It includes all the chlorobenzene and the other groundwater contaminants in the chlorobenzene, including some benzene and TCE. The second area is called the "benzene plume" and includes only the benzene that is *not commingled* (mixed) with chlorobenzene. The third area, called the TCE plume, consists of the TCE at the joint site that is *not commingled* with the chlorobenzene. For simplicity, Figure 5 shows the chlorobenzene and benzene plumes only. The TCE plume, though not shown, would lie inside the northern portion of the benzene plume on this figure.

EPA'S PROPOSED APPROACH TO CLEANUP

The alternatives EPA considered for this action are described on page 8 of this fact sheet. However, all of the alternatives assume the same basic cleanup approach: containment of some water, and cleanup to drinking water standards for the rest of the water. The following sections explain this overall part of EPA's proposal so that the specific alternatives are more easily understood.

Containment: For Water That Can't Be Cleaned Up

When a potential drinking water source - or aquifer- is contaminated, state and federal regulations direct EPA to attempt to restore groundwater to drinking water standards, within a reasonable period of time. However, there are situations in which there is no known technology capable of doing this. When this happens, EPA issues what is called a technical impracticability waiver for some of the usual cleanup requirements. EPA proposes to issue this type of waiver for the water at the joint site in a defined area near where the NAPL is present.

At the joint site, a large portion of the water can be restored to drinking water standards, but some of it cannot. The water that is in and near the NAPL cannot be cleaned to drinking water standards in a reasonable time frame. This is because there is no feasible way to remove all of the NAPL. As long as some NAPL is present, it can dissolve into the groundwater and re-contaminate it, no matter how much one tries to clean it.

EPA proposes to use a strategy called **containment** for the groundwater that is in or close to the NAPL. This means that a zone is created from which the contaminants in the water around the NAPL cannot escape. The zone is maintained indefinitely, and is monitored to make sure the contaminants are contained at all times. The purpose of this zone is to *isolate* the NAPL from the rest of the groundwater. All of the remedial alternatives EPA considered use the approach of containment for the groundwater contamination in and around the NAPL zone.

How are contaminants contained? Containment can be done in one of two ways: by pumping the water from the ground to keep it from moving away, or in certain special cases by relying on what is called intrinsic biodegradation (See box). The pumping option is described below.

EPA proposes the containment zone shown on Figure 6. As can be seen, because the benzene plume has not moved far from the NAPL, the entire benzene plume (both NAPL and dissolved contamination) falls within the containment zone. However, most of the much larger chlorobenzene plume lies outside the containment zone.

Even though we cannot remove enough NAPL from the ground to restore all the groundwater to drinking water standards, EPA is considering whether some of the NAPL should be removed. EPA will make a separate decision about the degree to which NAPL will be removed at the Montrose

WHAT IS INTRINSIC BIODEGRADATION?

Intrinsic biodegradation is the breakdown of contaminants by microscopic organisms (such as bacteria) already in the ground. These bacteria degrade the contaminants by consuming them as food. Biodegradation means breaking down by biological means (e.g. bacteria), and intrinsic means the bacteria are already there. Where it exists and is reliable, intrinsic biodegradation can slow, stop, or even reverse the movement of contamination in the groundwater. Intrinsic biodegradation is not reliable for all contaminants; it must be verified and occurs only in specific situations. In the case of the joint site, there is significant evidence that intrinsic biodegradation is occurring strongly and reliably in the benzene plume, but there is not evidence that it is occurring reliably in either the chlorobenzene or the TCE plume. EPA proposes to extensively monitor the groundwater contamination to ensure that intrinsic biodegradation remains effective over time.

and Del Amo sites, after the ROD is issued for the cleanup action represented in this proposed plan.

Treatment: For Most of the Groundwater That Can Be Cleaned

After the groundwater around the NAPL areas is contained, the contaminants that dissolve into the groundwater from the NAPL can no longer move away in the groundwater. EPA proposes to clean the contaminated groundwater *outside* of the containment zone to drinking water standards. EPA uses the lower of the state and federal drinking water standards, which for chlorobenzene is 70 ppb, for benzene is 1 ppb, and for TCE is 5 ppb. This area of contaminated groundwater will shrink as the cleanup takes place until only the containment zone around the NAPL remains (Figure 6).

Cleaning the water is achieved by pumping it from the ground from many wells called extraction wells. The contaminated water is safely piped to one or more small treatment plants which will most-likely be located on the former Montrose and/or Del Amo properties. At the treatment plant, the water is treated to reduce the concentrations of contaminants to drinking water standards. Most of the cleaned water is then returned, or **re-injected**, back into the ground. In several of EPA's alternatives, a small portion (less than 10%) of the treated water is discharged to the storm drain, which empties to the Dominguez Channel, a stormwater channel. After treatment, the water would be clean enough to drink, so discharge in either manner poses no human health risk.

What does the treatment plant do to treat the water? EPA proposes to allow for several treatment technologies, called (1) adsorption, (2) air stripping, and (3) fluidized bed reactor. (Figure 7). With **adsorption**, the water coming into the treatment plant is run through a bed of carbon or specialized beads, which adsorb the contaminants out of the water. When the carbon or beads are full of contaminants, they can be sent offsite and regenerated (cleaned), which allows the contaminants to be safely recovered so the carbon or beads

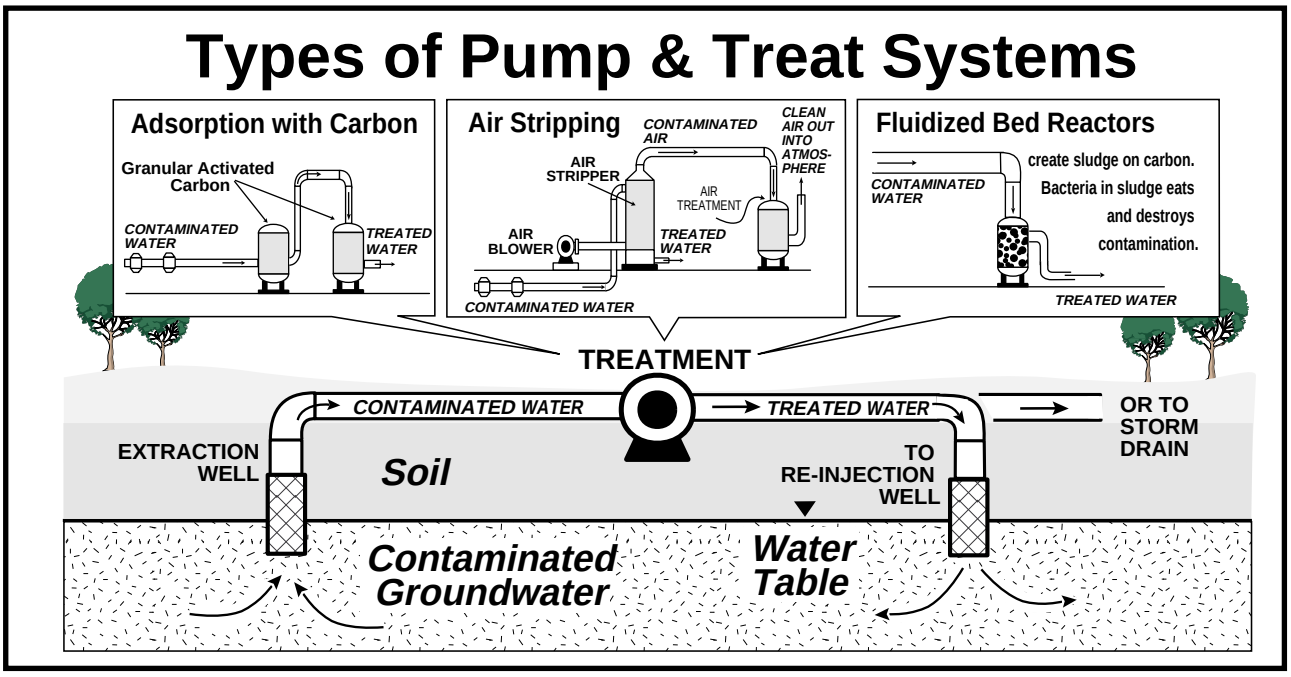


Figure 7: Types of Groundwater Treatments

can be reused. Alternately, the carbon can be sent to a landfill designed and approved to receive hazardous waste. With **air stripping**, the water is mixed with air and the volatile contaminants are transferred into the air. The air is then passed through a carbon bed and the contaminants are transferred to the carbon, just as with adsorption. The clean air is then discharged back into the atmosphere. With a **fluidized bed reactor**, the contaminated water is passed through a bed which has a biological sludge on it. The bacteria in the sludge degrade most of the contaminants, breaking them down into non-toxic forms. When using this technology, there is sometimes the need to dispose of the sludge. When necessary, sludge is disposed at an approved hazardous waste landfill.

These technologies do not have to be used alone but can be teamed together to ensure that all contaminants are reduced to drinking water standards and meet discharge requirements. EPA has considered several other minor technologies, where necessary, to ensure that the treated water can be discharged safely and in accordance with laws and regulations that apply to the discharge.

The Alternatives EPA Considered for this Cleanup Action

EPA developed five alternatives for the cleanup of groundwater at the joint site. EPA is proposing to implement **Alternative 4** shown below. Except for Alternative 1, each of

SUMMARY OF ALTERNATIVES

		/----------FASTER CLEANUP ---------->			
	ALT. 1 "NO ACTION"	**ALT. 2**	**ALT. 3**	**ALT. 4**	**ALT. 5**
CHLOROBENZENE PLUME					
How much is the Chlorobenzene Plume pumped?	No action	350 gal./minute	350 gal./minute	700 gal./minute	1400 gal./minute
How is the NAPL Area in the Chlorobenzene contained?	No containment	Extract/treat groundwater	Extract/treat groundwater	Extract/treat groundwater	Extract/treat groundwater
Where is the Treated Water discharged?	No discharge	Re-inject into ground	Re-inject into ground	Re-inject into ground	Re-inject into ground
BENZENE PLUME					
Approximately how much is the Benzene Plume pumped?	40 gal./minute	Benzene plume not pumped	40 gal./minute	40 gal./minute	40 gal./minute
How is the NAPL Area in the Benzene Plume (w/NAPL) contained?	No containment	Rely on intrinsic biodegradation to contain the entire plume	Contain the UBF and MBFB Sand with intrinsic biodegradation --- Contain the MBFC Sand with pumping and treating the groundwater	Contain the UBF and MBFB Sand with intrinsic biodegradation --- Contain the MBFC Sand with pumping and treating the groundwater	Contain the UBF and MBFB Sand with intrinsic biodegradation --- Contain the MBFC Sand with pumping and treating the groundwater
Where is the Treated Water discharged?	No discharge	Nothing to discharge	Storm Drain	Storm Drain	Storm Drain
TCE PLUME					
What is Done?	No action	Pump and treat to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone	Pump and treat to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone	Pump and treat to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone	Pump and treat to partially contain the sources; TCE is not allowed to spread beyond TI waiver zone
COSTS OF THE ALTERNATIVES*	$0	$20,843,000	$25,971,000	***EPA's Preferred Alternative*** $29,981,000	$39,871,000

Includes the sum of capital and operation & maintenance costs expressed as 30-year present worth values.

the alternatives contains a cleanup action for the chlorobenzene plume, the benzene plume, and the TCE plume. Because the benzene plume and the TCE plume lie entirely within the containment zone around the NAPL, it is the larger chlorobenzene plume that would be reduced in size and restored to drinking water standards in this cleanup action.

Alternative 1, No Action, is required by regulation to be included in EPA's evaluation for purposes of comparison, even though it would not be protective of human health. The remaining alternatives (2-5) differ in terms of the rate that the cleanup of the chlorobenzene plume outside the containment zone would occur, and the strength of the flushing of contaminants out of the ground. Three groundwater extraction rates for the chlorobenzene plume are reflected in the alternatives: 350 gallons per minute (gpm), 700 gpm, and 1400 gpm. The higher the rate, the faster the cleanup could be expected to occur.

In all alternatives except the No Action Alternative (Alternative 1), the immediate sources of the TCE plume are partially contained by a low rate of pumping and treating groundwater. Treated water would be injected back into the ground. As discussed earlier, EPA has proposed to create a zone in which the benzene plume will be contained. The TCE plume lies within and under this benzene plume. EPA proposes that if the TCE plume moves outside or out-from-under the zone being contained for benzene in the future, additional groundwater would be pumped and treated to contain the TCE to the containment zone. The TCE also would not be allowed to move downward more than it has already moved. This approach to the TCE plume is the same in all the alternatives, so the TCE plume is not discussed further below.

EPA proposes a Technical Impracticability (TI) waiver zone approximately as shown on Figure 6. In the chlorobenzene plume, EPA proposes that the TI waiver extend down to the Gage Aquifer. In the TCE and benzene plumes, EPA proposes that the TI waiver zone extend only to the MBFC Sand. All alternatives, other than **no action**, also include continual groundwater monitoring (sampling) to ensure the contamination remains contained. EPA proposes groundwater pumping and treating be employed to restore the containment, should intrinsic biodegradation fail. All alternatives, other than no action, also include institutional controls, where possible, to ensure people do not use the groundwater while it is being cleaned up.

Summary of EPA's Evaluation of Alternatives

The time needed to complete this cleanup is long (in excess of 50 years), and computer modeling predictions (including those from the model used for this analysis) are not reliable for such long time frames. Because of this, we cannot reliably know the total time to cleanup. EPA has compared alternatives based on modeling simulations at 25 years into the future. While the cleanup is not complete under any of the alternatives at 25 years of operation, the performance and the progress toward the cleanup goal for each of the alternatives can be compared in this way.

Because the time frame of the remedy is so long, there cannot be absolute certainty that the goals of the remedy will be met in the distant future. However, EPA has compared the alternatives with respect to the degree of *certainty* that, 50 or 100 years or more from now, the drinking water standards will be attained everywhere in the portion of the chlorobenzene plume that is being restored to drinking water standards. Some alternatives provide more certainty, others less.

In evaluating five possible alternatives, EPA applied the nine selection criteria from the Superfund regulations (see graphic this page).

○ **Alternative 1 (No Action Alternative):** No action would be taken, and no treatment or monitoring would occur. Contamination would continue to move unchecked and unmonitored. NAPL would continue to contaminate groundwater. Potential health risks, if realized, would remain. Existing groundwater contamination would remain indefinitely, on the order of centuries, and could continue to impact new areas. Alternative 1 would not be protective of human health and the environment in the long term, and would not meet Applicable or Relevant and Appropriate Requirements (ARARs - see discussion of Superfund Nine Criteria, page 9). It also would not reduce the mobility, toxicity or volume of contaminants, and by definition includes no treatment. There is no direct cost associated with this alternative. Alternative 1 ranks the lowest with respect to all of the nine NCP criteria (see box), except for cost.

○ **Alternative 2:** Alternative 2 has the potential to be protective of human health over time and to meet ARARs, but because the chlorobenzene plume pump rate of 350 gpm is low, the time to complete the remedy is the longest of any of the alternatives (except for Alternative 1). After 25 years, the model predicts that about one third of the chlorobenzene plume would be removed.

Scientists use the concept of flushing to measure how effectively the contaminants are swept out of the soil by a pumping and injection system. The flushing of the ground by the pumping in this alternative is somewhat sporadic and limited. The effectiveness of this alternative in the short and long term is therefore the least among the alternatives.

Alternative 2 would stop the chlorobenzene plume from spreading and gradually reduce its size. Because of the exceptionally long time frame of the cleanup under Alternative 2, and the poor performance particularly in the first 25 years, there is greater uncertainty compared to the other alternatives that drinking water standards would ultimately be attained, and that the remedy would become fully protective, in the long term. Long term effectiveness and ability to reduce mobility, toxicity and volume of contaminants are less in this alternative than in alternatives 3, 4, and 5.

Alternative 2 relies on monitored intrinsic biodegradation entirely to contain the benzene plume. There is significant uncertainty as to whether intrinsic biodegradation will reliably contain the benzene plume in the MBFC Sand layer, if the pumping of the chlorobenzene plume were to occur. This is because pumping the chlorobenzene plume could pull on the benzene in this layer and may move it. Alternative 2 is the easiest to implement of the alternatives other than Alternative 1. **The cost of Alternative 2 would be $20,843,000.**

○ **Alternative 3:** Alternative 3 has all of the same qualities as Alternative 2 with respect to the chlorobenzene plume, but rather than relying on intrinsic biodegradation to contain the entire benzene plume, it uses pumping and treating of the water in the MBFC Sand layer to contain the benzene plume in the MBFC Sand layer. Because intrinsic biodegradation is merely a pre-exsiting condition in the soil, it cannot be controlled. However, pumping and treating can be designed and controlled directly to provide better and more reliable control of the possible movement of benzene in the MBFC Sand. This increases the certainty that the benzene plume will remain contained and will not move downward or sideways when chlorobenzene pumping is started.

Therefore, Alternative 3 has better certainty of long-term effectiveness and meeting ARARs in the long term, and therefore of long term protectiveness. Alternative 3 presents a few more implementability issues than does Alternative 2, because a separate system must be built and designed to implement the pumping and treatment of the MBFC Sand. However, Alternative 3 is still highly implementable. **The cost of Alternative 3 would be $25,971,000.**

✓ **Alternative 4:** Alternative 4 includes pumping and treating of the chlorobenzene plume at 700 gpm, as opposed to 350 gpm as in Alternatives 2 and 3. This increase in the pump rate means that much more of the plume is removed earlier, and that the overall cleanup time would be less. At 25 years, the model predicts that about two thirds of the chlorobenzene plume would be removed. Also, the flushing of the ground by this Alternative is greater and more efficient, covering the entire chlorobenzene plume more evenly. This means the alternative has a greater ability to remove contamination.

Alternative 4 has greater short- and long- term effectiveness than Alternative 3. There would be a greater certainty that the drinking water standards would be achieved and that the remedy would ultimately be protective in the long term. Alternative 4 also has a greater ability to reduce the mobility, toxicity and volume of contaminants in a shorter time.

Continued

Alternative 4 is the same as Alternative 3 with respect to the benzene plume.

Alternative 4 would be somewhat more difficult to implement compared to Alternative 3 due to the greater number of extraction wells and equipment required. However, Alternative 4 is still highly implementable.

The cost of Alternative 4 would be $ 29,981,000.

❍ **Alternative 5:** Alternative 5 includes pumping and treating of the chlorobenzene plume at 1400 gpm as opposed to 700 gpm in Alternative 4. This further increase in the pump rate means that still more of the plume is removed earlier, and the overall cleanup time would be less. At 25 years, the model predicts that 90% of the chlorobenzene plume would be removed (however, as discussed, the real time for cleanup is likely to be more than that predicted by the model).

The flushing of the ground under this alternative is greater than under Alternative 4 and covers the entire chlorobenzene plume. This results in greater short- and long-term effectiveness.

Alternative 5 provides the greatest certainty that drinking water standards will be attained and that the remedy will be protective of human health in the long term. Alternative 5 provides the greatest reduction in mobility, toxicity and volume of contaminants in the shortest time.

Alternative 5 is somewhat more difficult to implement than Alternative 4 due to the greater number of extraction wells and equipment required. Also, there can be difficulties with injecting water into the aquifer that may become more apparent at the higher pump rate in this alternative. However, Alternative 5 is still implementable. Alternative 5 is the same as Alternative 3 with respect to the benzene plume. **The cost of Alternative 5 would be $39,871,000.**

Rationale for EPA's Proposed Alternative

EPA is proposing to implement Alternative 4 because it provides (1) very significant certainty of protectiveness and attaining drinking water standards everywhere in the chlorobenzene plume in the long term, (2) removal of a majority of contaminants early rather than late during the long remedial action, and (3) good flushing of the contaminants, while still ensuring that the pumping does not cause unwanted movement of the NAPL or existing dissolved contamination.

Alternative 4, like Alternatives 3 and 5, provides pumping and treating in the MBFC Sand (the lower layer) of the benzene plume rather than simply relying on intrinsic biodegradation there. This is important, because groundwater moves more quickly in the MBFC Sand and it is closer to the deeper aquifers which are more likely to be used for drinking. It is important, therefore, to ensure that benzene in the benzene plume does not move down or sideways, especially once pumping of the chlorobenzene plume starts.

Alternatives 2 and 3 provide for too long a remedial action and too much uncertainty that the cleanup will be successful in the long term. Alternative 5 performs better than Alternative 4, but it also costs $10 million more. The increase in overall performance between Alternative 4 and 5 is significant but not as great as that between Alternatives 3 and 4. At the same time, the increase in cost between Alternative 4 and 5 is greater than the increase between Alternative 3 and 4. Thus, Alternative 4 is arguably the most cost-effective. Also, implementing Alternative 5 may create or worsen certain problems, such as being able to consistently reinject water, that are less of a problem with Alternative 4. On balance, EPA believes that Alternative 4 is an appropriate remedy to the groundwater problem for the joint site.

Alternative 4 can be implemented safely with respect to the surrounding community. There would be some construction activities to build pipelines, wells, and the treatment system. All of these activities could be performed with little inconvenience and essentially no risk to the community. Once operational, most of the operation and maintenance under Alternative 4 would take place at the treatment facilities at the former Montrose and Del Amo plant sites and the continued operation of the system would be largely transparent to the community.

EPA proposes to specify not only a pump rate for the chlorobenzene plume of approximately 700 gpm, but that the remedy be designed to provide similar performance (amount removed by various times) to that modeled in the Joint Groundwater Feasibility Study (JGWFS). EPA also proposes that additional sampling and modeling be conducted in the remedial design phase that will be necessary to complete the design.

EPA has proposed to reinject the water pumped from the chlorobenzene plume primarily because it is necessary to help control the movement of groundwater. However, under EPA's preferred alternative, the benzene plume would be pumped at a much lower rate of about 40 gpm. For this smaller amount

of water, it is likely to be more cost-effective to discharge to the storm drain system. The small volume of water also does not represent a significant loss of the groundwater resource, and so EPA has proposed discharge of treated water to the storm drain system.

Finalizing Del Amo Waste Pits ROD

On September 9, 1997, EPA issued a ROD for the Del Amo Waste pits. This ROD specified that the cleanup goals for soils under the waste pits were to be considered interim pending a decision by EPA on the groundwater. Under this proposal, the waste pits would lie within a containment zone that is subject to a TI waiver. This means that the water under the waste pits will not have to be cleaned up to drinking water standards, and that the existing soil standards in the Del Amo Waste Pits ROD will be sufficient to prevent significant additional contamination from entering the groundwater at that location. EPA proposes to make final the soil standards for the Del Amo waste pits as they currently exist in the Waste Pits ROD.

What is Risk and How is it Calculated?

At Superfund sites, EPA conducts what is called a risk assessment. A risk assessment uses information about the toxic properties of the chemicals at a site, and the ways in which people might become exposed to those chemicals, to calculate how significant the health risk is, or would be, to someone who is or might be exposed to the chemicals in the environment at a site. Actual health risks only occur if people are actually exposed to the chemicals. As a result, there is no immediate and direct risk from groundwater at the joint site at present because no one is currently drinking the contaminated groundwater and so there is no current exposure to the chemicals.

EPA's goal is to ensure that actual exposure to contaminated groundwater at unsafe levels at the joint site does not occur in the future. The State has defined all water under the site as a potential drinking water source. Because there is the potential that contaminated groundwater could be used in the future, EPA's risk assessment evaluates what the risk *would be* if someone were to use the groundwater. Such a person could be exposed to contaminants by drinking the water, or by breathing certain contaminants that volatilize out of the water during such activities as showering, toilet flushing, and clothes washing.

EPA considered and assessed these potential risks by evaluating: (1) the concentrations of the chemicals that are in the groundwater, (2) how much water a person typically uses, and (3) how much toxicity or health risk would be associated with chlorobenzene, benzene, TCE, and *all* of the chemicals in the groundwater. EPA typically uses protective assumptions and safety factors of hundreds or thousands of times when performing these types of calculations, to ensure that public health is protected.

EPA considers two types of risk: cancer risk and non-cancer risk. Cancer risk is the excess chance of getting cancer due to a chemical exposure, over a period of 30 years of exposure. For example, a groundwater cancer risk of one in one million would mean there is one chance in a million that a person would get cancer *because* of exposure to the chemicals in the groundwater, if the person were exposed to it for 30 years. Depending on the nature of a site, EPA typically considers risks in the range between 1 in 1 million and 1 in ten thousand to be acceptable. Non-cancer risk is measured by what is called a **hazard index** (HI). A HI at or below 1 means that it is extremely unlikely for any non-cancer toxic effect to occur. A hazard index above 1 means that toxic effects may occur, and the chance of occurrence will vary from small to large depending on the HI. EPA typically

WHAT WOULD BE THE HEALTH RISK IF SOMEONE USED THE GROUNDWATER?

The cancer and non-cancer risks, *if* someone were to use the water at the joint site, are very high. Risks were calculated for each of the groundwater layers or aquifers at the joint site. A summary of the risks is shown below.

	CANCER RISK		NON-CANCER HAZARD INDEX	
	Chlorobenzene Plume	Benzene Plume	Chlorobenzene plume	Benzene Plume
MBFB Sand	(Calculated in EPA's Risk Contours)	$3x10^{-1}$	(Calculated in EPA's Risk Contours)	12,724
MBFC Sand	$7x10^{-4}$	$1.3x10^{-1}$	178	9,839
Gage Aquifer	$1x10^{-5}$	----	50	----
Lynwood Aquifer	----	----	7.2	----

The figures in the table assume that a person is exposed to the average concentration of contamination of all water in each plume. A person's true exposure would depend on where his well was placed in the groundwater, and so his risk may be higher than this average risk. If a person placed a well near the highest concentrations and NAPL in the center of the plumes, the cancer risk would be higher than the average risk shown in the table. EPA has prepared a contoured map that shows how the risks would vary across the joint site depending on where a well was placed. This is available for your review upon request.

WHAT IS p-CBSA?

p-CBSA stands for *parachlorobenzene sulfonic acid.* This chemical is a waste product from the manufacture of DDT at the Montrose plant. p-CBSA is present in the groundwater at levels up to 110,000 ppb, and has moved out farther than has the chlorobenzene plume. Very little is known about whether and to what extent p-CBSA has toxic properties. A few short-term studies have indicated a low toxicity for this compound, however, no long-term studies have been performed. At this time, there are no state or federal standards for this chemical, and EPA believes there are insufficient data upon which to set standards.

EPA proposes to apply a limit of 25,000 ppb on the concentration at which p-CBSA can be re-injected into the ground. This is a criterion which EPA has considered but which the State has not yet formalized as regulation. EPA does not currently propose to capture or shrink the area affected by p-CBSA contamination at this time. EPA proposes to monitor p-CBSA movement and to periodically reconsider actions for p-CBSA as new studies and information on p-CBSA may be obtained.

considers non-cancer risks where the HI is less than 1 to be acceptable.

EPA's risk assessment does not evaluate past exposures or existing health effects. Such exposures and health effects are evaluated by the Federal Agency for Toxic Substances and Disease Registry (ATSDR).

Future Activities for Groundwater Cleanup

After the close of the public comment period, **July 31, 1998**, EPA will consider all comments it has received. EPA will then issue a formal document, called a Record of Decision (ROD), which explains in detail EPA's selected remedy for groundwater cleanup. This document will include EPA's responses to comments received during the public comment period.

After the ROD, EPA may decide to enter into negotiations with the parties responsible for contamination, to reach an agreement under which the responsible parties commit to finance and conduct the cleanup. If such an agreement cannot be reached, EPA can take appropriate enforcement actions against these parties and/or EPA may design and implement the cleanup action itself. ■

Opportunities for Community Involvement

Although EPA attempts to weigh all considerations when proposing a preferred remedy, it is not always possible for us to know about all the community's concerns. EPA invites your participation in selecting a groundwater cleanup remedy for the Del Amo and Montrose superfund sites. There are a number of ways you can become involved. A public meeting will be held July 25, 1998 from 1:00 to 5:00 p.m. to hear your comments on all the alternatives explained in this fact sheet (see box on pg. 1). You may provide your comments in writing or orally. The meeting will contain two segments. EPA will explain the site background, concepts, alternatives, and EPA's preferred alternative. EPA will then answer questions and accept formal comments from the community.

In addition, EPA welcomes comments submitted directly to our office. Please send them to the attention of Jeff Dhont (SFD-7-1), U.S. EPA, 75 Hawthorne Street, San Francisco, CA, 94105.

To learn more, you may find an extensive amount of information at EPA's information repositories at the Torrance or Carson public libraries. These repositories contain the documents that EPA used to identify its proposed remedy, called the Administrative Record. The administrative record is housed in the libraries on microfilm. However, selected important documents are also available in hard copy. The Administrative Record is also available at EPA's Region IX Offices in San Francisco. The library addresses and hours are listed below.

La traducción de este folleto está disponible a cualquier persona que llame a: Andy Bain 800-231-3075.

FOR MORE INFORMATION

If you would like more information or have questions about activities at the Del Amo or Montrose sites, or if you did not receive this fact sheet in the mail and would like to receive future fact sheets, please contact the following people:

Jeffrey Dhont
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U.S. EPA
75 Hawthorne St., SFD
San Francisco, CA 94105
(415) 744-2399

Andrew Bain
Community Involvement Coordinator
U.S. EPA
75 Hawthorne St., SFD-3
San Francisco, CA 94105
(415) 744-2186

You may leave a message for Andrew Bain by calling the Community Involvement toll free line at

800-231-3075

or by e-mail: bain.andrew@epamail.epa.gov

Information Repositories

Copies of the Interim Remedial Investigation/Feasibility Study report and other Superfund technical documents for the Montrose and Del Amo Superfund Sites are available for review at:

U.S. EPA Superfund Records Center
95 Hawthorne Street, Suite 403S
San Francisco, CA 94105
(415) 536-2000

Torrance Civic Center Library
3301Torrance Blvd.
Torrance, CA
(310) 618-5959

Carson Public Library
151 East Carson St.
Carson, CA
(310) 830-0901

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